

# DFS60I-Q4MK65536

DFS60

INCREMENTAL ENCODERS

**SICK**  
Sensor Intelligence.

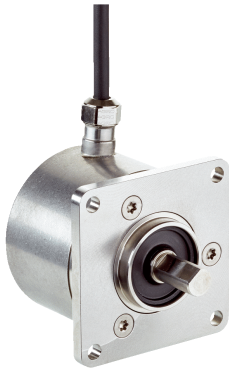


Illustration may differ



### Ordering information

Type	Part no.
DFS60I-Q4MK65536	1093571

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

### Detailed technical data

#### Safety-related parameters

<b>MTTF<sub>D</sub> (mean time to dangerous failure)</b>	300 years (EN ISO 13849-1) <sup>1)</sup>
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<sup>1)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40 °C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

#### Performance

<b>Pulses per revolution</b>	65,536 <sup>1)</sup>
<b>Measuring step</b>	90°, electric/pulses per revolution
<b>Measuring step deviation at binary number of lines</b>	± 0.0015°
<b>Error limits</b>	± 0.03°

<sup>1)</sup> See maximum revolution range.

#### Interfaces

<b>Communication interface</b>	Incremental
<b>Communication Interface detail</b>	TTL / HTL
<b>Factory setting</b>	Factory setting: output level TTL
<b>Number of signal channels</b>	6-channel
<b>0-set function via hardware pin</b>	✓
<b>0-SET function</b>	H-active, L ≡ 0 - 3 V, H ≡ 4.0 - U <sub>s</sub> V <sup>1)</sup>
<b>Programmable/configurable</b>	✓
<b>Initialization time</b>	32 ms, 30 ms <sup>2)</sup>
<b>Output frequency</b>	≤ 820 kHz
<b>Load current</b>	≤ 30 mA
<b>Operating current</b>	40 mA (without load)

<sup>1)</sup> Only with devices with M12 connector in connection with electrical interfaces M, V and W.

<sup>2)</sup> With mechanical zero pulse width.

<b>Power consumption</b>	≤ 0.7 W (without load)
<b>Load resistance</b>	≥ 120 Ω

<sup>1)</sup> Only with devices with M12 connector in connection with electrical interfaces M, V and W.

<sup>2)</sup> With mechanical zero pulse width.

## Electronics

<b>Connection type</b>	Cable, 12-wire, radial, 1.5 m
<b>Supply voltage</b>	4.5 ... 32 V
<b>Reference signal, number</b>	1
<b>Reference signal, position</b>	90°, electric, logically gated with A and B
<b>Reverse polarity protection</b>	✓
<b>Short-circuit protection of the outputs</b>	✓ <sup>1) 2)</sup>

<sup>1)</sup> Programming TTL with ≥ 5.5 V: short-circuit opposite to another channel or GND permissible for maximum 30 s.

<sup>2)</sup> Programming HTL or TTL with < 5.5 V: short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

## Mechanics

<b>Mechanical design</b>	Solid shaft, Square flange
<b>Shaft diameter</b>	10 mm With face
<b>Shaft length</b>	19 mm
<b>Weight</b>	+ 0.5 kg
<b>Shaft material</b>	Stainless steel V2A
<b>Flange material</b>	Stainless steel V2A
<b>Housing material</b>	Stainless steel V2A
<b>Start up torque</b>	1 Ncm (+20 °C)
<b>Operating torque</b>	0.5 Ncm (+20 °C)
<b>Permissible shaft loading</b>	80 N (radial) 40 N (axial)
<b>Operating speed</b>	≤ 9,000 min <sup>-1</sup> <sup>1)</sup>
<b>Moment of inertia of the rotor</b>	6.2 gcm <sup>2</sup>
<b>Bearing lifetime</b>	3.6 x 10 <sup>10</sup> revolutions
<b>Angular acceleration</b>	≤ 500,000 rad/s <sup>2</sup>

<sup>1)</sup> Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

## Ambient data

<b>EMC</b>	According to EN 61000-6-2 and EN 61000-6-3
<b>Enclosure rating</b>	IP67, housing side (IEC 60529) IP67, shaft side (IEC 60529)
<b>Permissible relative humidity</b>	90 % (Condensation not permitted)
<b>Operating temperature range</b>	-40 °C ... +100 °C <sup>1)</sup> -30 °C ... +100 °C <sup>2)</sup>
<b>Storage temperature range</b>	-40 °C ... +100 °C, without package
<b>Resistance to shocks</b>	100 g, 6 ms (EN 60068-2-27)

<sup>1)</sup> Stationary position of the cable.

<sup>2)</sup> Flexible position of the cable.

<b>Resistance to vibration</b>	10 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)
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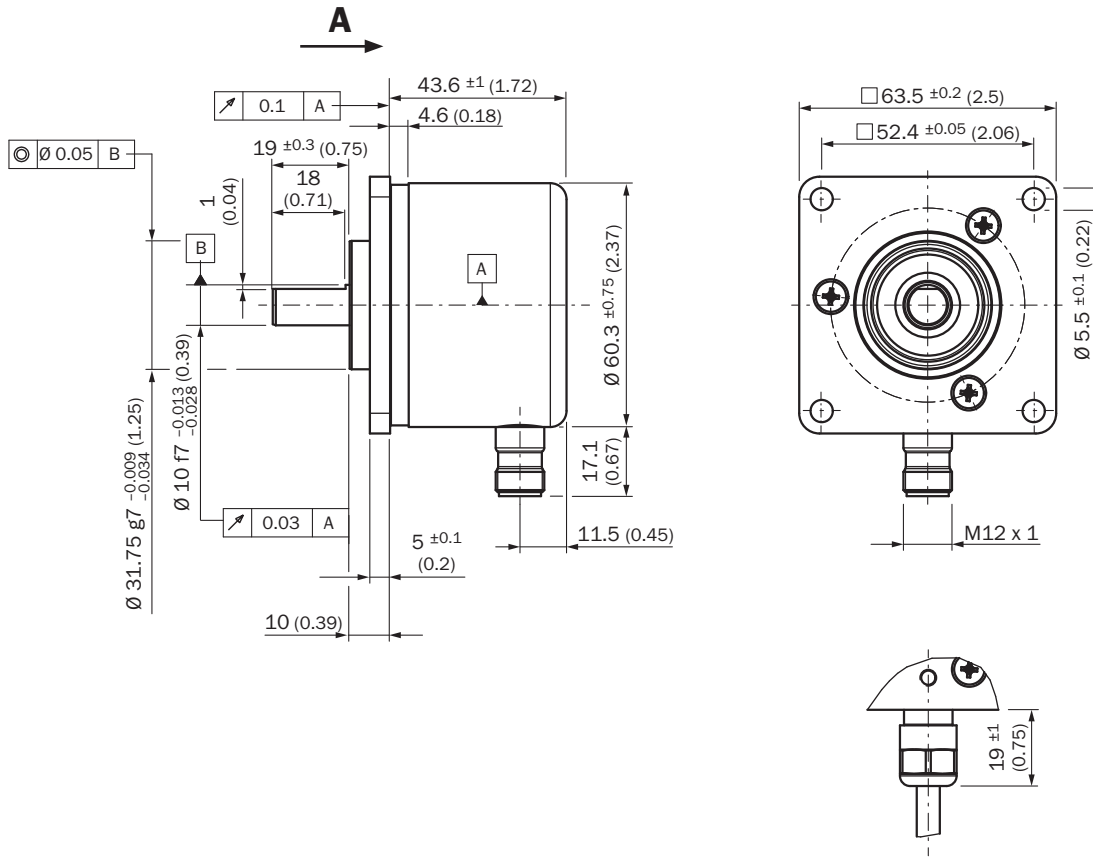
<sup>1)</sup> Stationary position of the cable.

<sup>2)</sup> Flexible position of the cable.

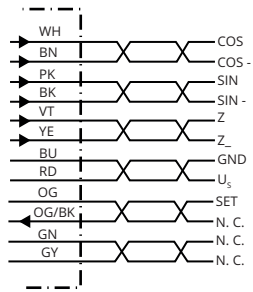
### Classifications

<b>ECLASS 5.0</b>	27270501
<b>ECLASS 5.1.4</b>	27270501
<b>ECLASS 6.0</b>	27270590
<b>ECLASS 6.2</b>	27270590
<b>ECLASS 7.0</b>	27270501
<b>ECLASS 8.0</b>	27270501
<b>ECLASS 8.1</b>	27270501
<b>ECLASS 9.0</b>	27270501
<b>ECLASS 10.0</b>	27270501
<b>ECLASS 11.0</b>	27270501
<b>ECLASS 12.0</b>	27270501
<b>ETIM 5.0</b>	EC001486
<b>ETIM 6.0</b>	EC001486
<b>ETIM 7.0</b>	EC001486
<b>ETIM 8.0</b>	EC001486
<b>UNSPSC 16.0901</b>	41112113

**Dimensional drawing** (Dimensions in mm (inch))



**PIN assignment**

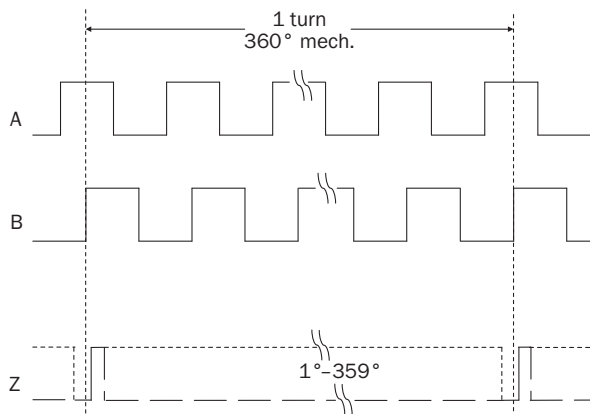


Male connector M12, 8-pin	Connector M12, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V <sub>PP</sub>	Explanation
1	7	Brown	A	COS-	Signal wire
2	6	White	A	COS+	Signal wire
3	9	Black	B	SIN-	Signal wire
4	8	Pink	B	SIN+	Signal wire
5	4	Yellow	Z	Z	Signal wire
6	11	Purple	Z	Z	Signal wire
7	12	Blue	GND	GND	Ground connection

Male connector M12, 8-pin	Connector M12, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V <sub>PP</sub>	Explanation
8	5	Red	+U <sub>S</sub>	+U <sub>S</sub>	Supply voltage
-	2	-	N.c.	N.c.	Not assigned
-	3	-	N.c.	N.c.	Not assigned
-	1	-	N.c.	N.c.	Not assigned
-	10 <sup>1)</sup>	-	0-SET <sup>1)</sup>	N.c.	Set zero pulse <sup>1)</sup>
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

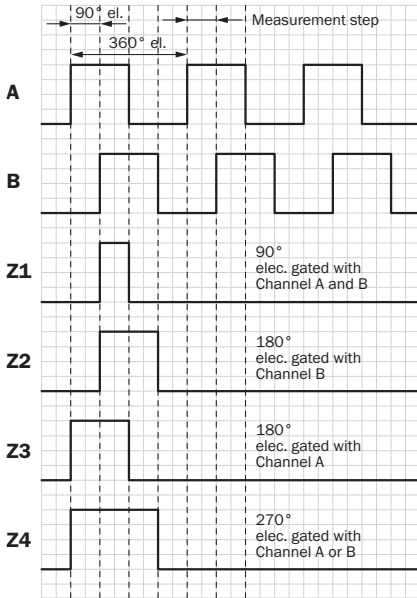
### Diagrams

Mechanical zero pulse width 1° to 359° programmable. Width of the zero pulse in relation to a mechanical revolution of the shaft.



Supply voltage	Output
4,5 V ... 32 V	TTL/HTL programmable

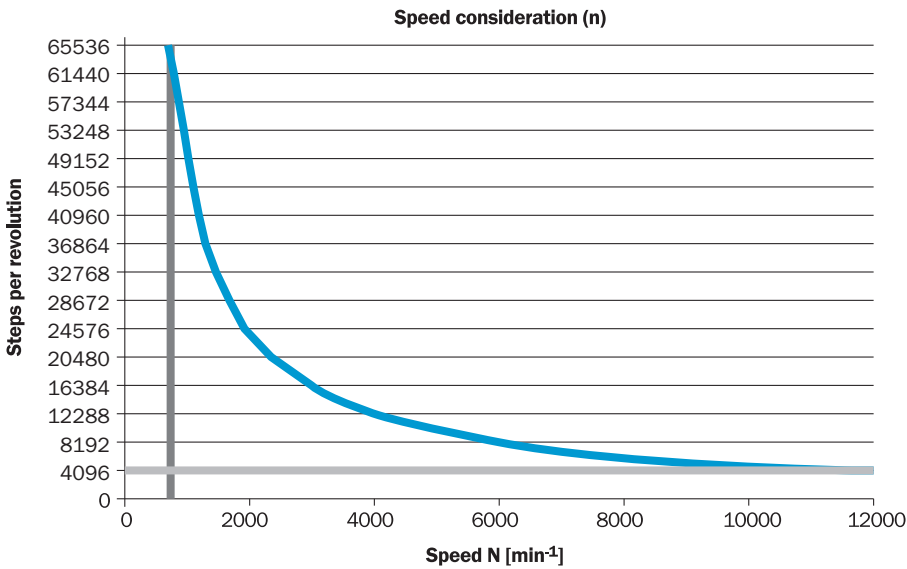
Electrical zero pulse width can be configured to 90°, 180°, or 270°. Width of the zero pulse in relation to a pulse period.



Cw with view on the encoder shaft in direction "A", compare dimensional drawing.

Supply voltage	Output
4,5 V ... 32 V	TTL/HTL programmable

Maximum revolution range



















### Recommended accessories

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

	Brief description	Type	Part no.
<b>Programming and configuration tools</b>			
	USB programming unit, for programmable SICK encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoders	PGT-08-S	1036616
	Programming unit display for programmable SICK DFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoder with DFS60, AFS/AFM60 and AHS/AHM36. Compact dimensions, low weight, and intuitive operation.	PGT-10-Pro	1072254
<b>Other mounting accessories</b>			
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227
	Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AK	4084737
	Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AP	4084738
	Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APG	4084740
	Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APN	4084739
	Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AK	4084733
	Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AP	4084734
	Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500APG	4084736
	Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500APN	4084735
<b>Shaft adaptation</b>			
	Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular +/- 4°; max. speed 10,000 rpm, -30 °C to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982
	Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially +/- 2,5 mm, axially +/- 3 mm, angle +/- 10 degrees; max. speed 3.000 rpm, -30 to +80 degrees Celsius, torsional spring stiffness of 25 Nm/rad	KUP-0610-D	5326697
	Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial +/- 0.3 mm, axial +/- 0.4 mm, angular +/- 2.5°; max. speed 12,000 rpm, -10° to +80 °C, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-0610-F	5312985



	Brief description	Type	Part no.
	Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. $10^\circ$ , $-30^\circ$ °C to $+80^\circ$ °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0610-J	2127056
	Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial $\pm 0,3$ mm, axial $\pm 0,3$ mm, angular $\pm 3^\circ$ ; max. speed 10.000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
	Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially $\pm 0,25$ mm, axially $\pm 0,4$ mm, angle $\pm 4$ degrees; max. speed 10.000 rpm, $-30$ to $+120$ degrees Celsius, torsional spring stiffness of 150 Nm/rad	KUP-0810-D	5326704
	Claw coupling, shaft diameter 8 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. $10^\circ$ , $-30^\circ$ °C to $+80^\circ$ °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0810-J	2128267
	Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial $\pm 0,3$ mm, axial $\pm 0,3$ mm, angular $\pm 3^\circ$ ; max. speed 10.000 rpm, $-10^\circ$ to $+80^\circ$ °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0810-S	5314178
	Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. revolutions 10,000 rpm, $-30^\circ$ to $+120^\circ$ °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1010-B	5312983
	Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial $\pm 2.5$ mm, axial $\pm 3$ mm, angular $\pm 10^\circ$ ; max. speed 3,000 rpm, $-30^\circ$ to $+80^\circ$ °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1010-D	5326703
	Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial $\pm 0.3$ mm, axial $\pm 0.4$ mm, angle $\pm 2.5^\circ$ , torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-F	5312986
	Claw coupling, shaft diameter 10 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. $10^\circ$ , $-30^\circ$ °C to $+80^\circ$ °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-1010-J	2127054
	Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial $\pm 0.3$ mm, axial $\pm 0.2$ mm, angular $\pm 3^\circ$ ; speed 10,000 rpm, $-10^\circ$ to $+80^\circ$ Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub	KUP-1010-S	2056408
	Spring coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial $\pm 1.5$ mm, axial $\pm 1.0$ mm, angular $\pm 5^\circ$ , max. speed 3,000 rpm, $-30^\circ$ to $+120^\circ$ °Celsius, nominal torque 150 Ncm, rotational angle at half nominal torque, direction of rotation right viewed on driving shaft $40^\circ$ , left viewed on driving shaft $60^\circ$ , material: spring steel 1.0600 nickel plated, zinc die cast hubs	KUP-1010-W	5319914
	10 mm / 12 mm; maximum shaft offset: radial $\pm 0.25$ mm, axial $\pm 0.4$ mm, angular $\pm 4^\circ$ ; max. revolutions 10,000 rpm, $-30^\circ$ to $+120^\circ$ °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1012-B	5312984
	Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial $\pm 2.5$ mm, axial $\pm 3$ mm, angular $\pm 10^\circ$ ; max. speed 3,000 rpm, $-30^\circ$ to $+80^\circ$ °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1012-D	5326702
	Claw coupling, shaft diameter 10 mm / 12 mm, damping element 80 shore blue, maximum shaft offset: radial $\pm 0.22$ mm, axial $\pm 1$ mm angular $\pm 1.3^\circ$ , max. speed 19,000 rpm, angle of twist max. $10^\circ$ , $-30^\circ$ °C to $+80^\circ$ °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-1012-J	2128265

	Brief description	Type	Part no.
Others			
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Male connector, M23, 12-pin, straight, A-coded</li> <li>• <b>Signal type:</b> HIPERFACE<sup>®</sup>, SSI, Incremental</li> <li>• <b>Description:</b> HIPERFACE<sup>®</sup>, SSI, Incremental, shielded, Head A: male connector, M23, 12-pin, straight, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: -40 °C ... +125 °C</li> <li>• <b>Connection systems:</b> Solder connection</li> </ul>	STE-2312-G01	2077273
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, terminal box, 8-pin, straight</li> <li>• <b>Connection type head B:</b> Male connector, D-Sub, 9-pin, straight</li> <li>• <b>Signal type:</b> SSI + incremental</li> <li>• <b>Cable:</b> 0.5 m, 4-wire, PVC</li> <li>• <b>Description:</b> SSI + incremental, shielded, Programming cable for PGT-08-S and PGT-10-S programming tool</li> <li>• <b>Note:</b> Programming adapter cable for programming tool PGT-10-Pro and PGT-08-S</li> </ul>	DSL-0D08-G0M5AC3	2061739

## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

## WORLDWIDE PRESENCE:

Contacts and other locations –[www.sick.com](http://www.sick.com)